

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicants : Patricia Wei Yin Chiang et al.
Application No. : 10/500,453
Filed : March 10, 2005
For : **VIDEO ENCODING**

Examiner : Jessica Marie Prince
Art Unit : 2485
Docket No. : 851663.473USPC
Date : September 9, 2011

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
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APPELLANT'S BRIEF

Commissioner for Patents:

This brief is in furtherance of the Notice of Appeal, filed in this case on May 17, 2011. The fees required under Section 41.20(b)(2), and any required request for extension of time for filing this brief and fees therefor, are dealt with in the accompanying transmittal letter.

I. REAL PARTY IN INTEREST

The real party in interest in the above-identified application is the assignee, STMICROELECTRONICS ASIA PACIFIC PTE LTD., of 28 Ang Mo Kio Industrial Park 2 Singapore, Singapore 569508.

II. RELATED APPEALS AND INTERFERENCES

None.

III. STATUS OF CLAIMS

Claims 5-7, 10-16, 25, 26, and 30-33 are allowed. Claims 34-46 are appealed and stand rejected under 35 U.S.C. § 103(a). A copy of the claims on appeal is included herewith as Appendix A.

IV. STATUS OF AMENDMENTS

No amendments were filed subsequent to the Final Office Action dated February 17, 2011.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The present application includes six independent claims, two of which are being appealed (claims 34 and 42). The following summary discusses the subject matter of the independent appealed claims along with citations to corresponding portions of the specification and drawings per 37 C.F.R. § 41.37(c)(1)(v). The citations below are provided to illustrate specific examples and embodiments of the recited language, and are not intended to limit the claims.

It is believed that the claimed invention will be more easily understood if some embodiments shown in the figures of the present application are discussed first. Following that discussion is a presentation of the independent claims with reference to the figures and specification. Of course, the parentheticals shown in claims 34 and 42 are intended to show support for the claimed elements, and are not intended to limit the claims only to the embodiments referenced in the parentheticals.

One embodiment of the application is a video encoding module (Figure 2) for encoding a given input video. Prior art video encoding modules encode an input video “on-the-fly” by breaking up the input video into macroblocks and encoding a current macroblock based on one or more previous macroblocks of the same input video. In contrast, the video encoding module of Figure 2 of the present application encodes an input video based on statistics or metrics obtained while encoding one or more reference videos prior to even receiving the input video. For example, predicted bit counts are determined based on block spatial activity and executed by the predictor 406 shown in Figure 2 of the application below.

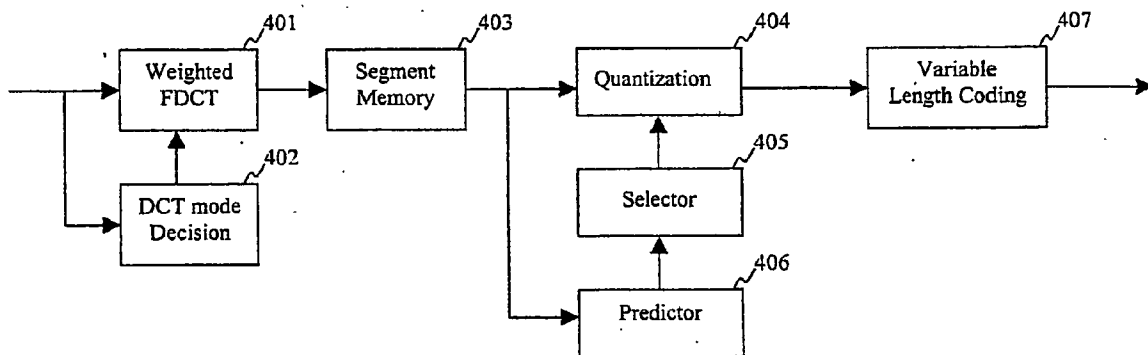


Figure 2

The set of bit count estimates for each macroblock determined by the predictor 406 are processed by the selector module 405 to choose an optimal quantization vector for each macroblock, such that the sum of the predicted numbers of bits for the macroblocks of a video segment is less than the predetermined bit budget. Note that the parameters for the metric functions are initially determined experimentally from a generic or reference video sequence by a calibration process. The calibration process is executed by a calibration system that is not part of the video encoder.

34. (Previously Presented) A method, comprising:

determining a relationship between first metric values and respective quantities of encoded video data, the first metric values generated by encoding reference video data from a reference video, the reference video including a plurality of macroblocks, using a metric function and respective first encoding parameters (Page 6, lines 18-23, Page 8, lines 1-10, Figure 6, reference numbers 801-803, Figure 7, reference numbers 506 and 508);

after determining the relationship, under control of a video encoder that is at least one of a configured hardware circuit and a programmed computer (Figure 2, reference numbers 401-407):

receiving an input video, the input video including a plurality of macroblocks distinct from the plurality of macroblocks of the reference video (Page 6, lines 9-17, Page 8, lines 1-10, Page 9, lines 15-25, Page 17, lines 1-7, Page 19, lines 3-11, Figure 2 reference number 406);

generating second metric values from input video data of the input video using respective second encoding parameters (Page 6, lines 15-20, Figure 2, reference number 406, Figure 3, reference number 205, Page 10, lines 14-26);

selecting at least one of the second encoding parameters based on a desired quantity of encoded video data and the relationship between the first metric values and the respective quantities of encoded video data (Page 14, lines 3-14, Figure 2, reference number 405); and

encoding the input video data using the selected at least one encoding parameter (Page 15, lines 4-11, Figure 2, reference number 407).

42. (Previously Presented) A video encoding module (Figure 2, reference numbers 401-407), comprising:

a memory configured to store a predetermined relationship between first metric values and respective quantities of encoded video data (Page 9, lines 15-26, Figure 2, reference number 403), the predetermined relationship being determined during a calibration process and based at least in part on generating the first metric values from reference video data of a reference video, the reference video including a plurality of macroblocks (Page 14, lines 4-9), using a metric function and respective first encoding parameters, and generating the respective quantities by encoding the reference video data using the respective first encoding parameters (Page 17, lines 1-7, Page 6, lines 18-23, Page 8, lines 1-10, Figure 6, reference numbers 801-803, Figure 7, reference numbers 506 and 508);

a predictor module configured to receive input video data from an input video, the input video including a plurality of macroblocks distinct from the plurality of macroblocks of the reference video, and to generate second metric values from the input video data using the metric function and respective second encoding parameters (Page 6, lines 9-17, Page 8, lines 1-10, Page 9, lines 15-25, Page 17, lines 1-7, Page 19, lines 3-11, Figure 2 reference number 406); and

a selector module configured to select at least one of the second encoding parameters based on a desired quantity of encoded video data and the stored predetermined relationship data (Page 14, lines 3-14, Figure 2, reference number 405),

wherein the video encoding module further includes at least one of a dedicated hardware circuit configured to implement the predictor module, and a processor configured to execute the predictor module (Page 10, lines 14-26, Figure 3, reference number 406).

36. (Previously Presented) The method of claim 34 wherein the determining the relationship between first metric values and respective quantities of encoded video data is performed as part of a calibration process, and wherein the receiving the input video occurs after the calibration process is performed (Page 17, lines 1-7, Page 19, lines 3-11, Figure 2 reference number 406).

VI. GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Claims 34, 36, 37, 39 and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., Target Bit Matching for MPEG-2 Video Rate Control in view of Pullen et al., US 5,923,376.

Claims 35, 42 and 44-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., Target Bit Matching for MPEG-2 Video Rate Control, in view of Pullen et al., US 5,923,376, in view of Oikawa et al., US 5,677,734.

Claim 38 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., Target Bit Matching for MPEG-2 Video Rate Control, in view of Pullen et al., US 5,923,376 in view of Wu et al., US 6,974,378.

Claim 40 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., Target Bit Matching for MPEG-2 Video Rate Control, in view of Pullen et al., US 5,923,376, in view of Boice et al., US 5,644,504.

Claim 44 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al., Target Bit Matching for MPEG-2 Video Rate Control in view of Pullen et al., US 5,923,376, in view of Oikawa et al., US 5,677,734, and in view of Wu et al., US 6,974,378.

VII. ARGUMENT

A. *Legal Overview*

The Examiner initially bears the burden of establishing a *prima facie* case of obviousness. *In re Bell*, 26 U.S.P.Q.2d 1529 (Fed. Cir. 1993); *In re Oetiker*, 977 F.2d 1443, 1445, 24 U.S.P.Q.2d 1443, 1444 (Fed. Cir. 1992); *In re Piasecki*, 745 F.2d 1468, 1472, 223 U.S.P.Q. 785, 788 (Fed. Cir. 1984); MPEP § 2142. An Applicant may attack an obviousness rejection by showing that the Examiner has failed to properly establish a *prima facie* case or by presenting evidence tending to support a conclusion of non-obviousness. *In re Fritch*, 972 F.2d at 1265.

In order for an examiner to establish a *prima facie* case that an invention, as defined by a claim at issue, is obvious the examiner must: (1) show some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine the reference teachings; (2) there must be a reasonable expectation of success; and (3) the prior art reference (or the combined references) must teach or suggest all the claim limitations. *See In re Thrift and Hemphill*, 298 F.3d 1357, 1366 (Fed. Cir. 2002); MPEP § 2142.

The U.S. Supreme Court case, *KSR Int'l Co. v. Teleflex, Inc.*, does not change the requirement for an examiner to provide such evidence of motivation. 127 U.S. 1727, 1740-41 (2007). “The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, not in applicant’s disclosure.” MPEP § 2143. The level of skill in the art cannot be relied upon to provide the suggestion to combine the references. MPEP § 2143.01 (citing *Al-Site Corp. v. VSI Int'l Inc.*, 174 F.3d 1308, 50 U.S.P.Q.2d 1161 (Fed. Cir. 1999)). The mere fact that the references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the

desirability of the combination. MPEP § 2143.01 (citing *In re Mills*, 916 F.2d 680, 16 U.S.P.Q. 2d 1430 (Fed. Cir. 1990)).

Moreover, a reference must be viewed as a whole, including portions that would lead away from the claimed invention. MPEP § 2141.03 (citing *W.L. Gore & Assoc., Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 U.S.P.Q. 303 (Fed. Cir. 1983)). If the proposed modification would change the principles of operation of the prior art invention being modified, then the teachings of the references are not sufficient to render the claims *prima facie* obvious. MPEP § 2143.01 (citing *In re Ratti*, 270 F.2d 810, 123 U.S.P.Q. 349 (CCPA 1959)).

B. Claims 34-46 are Nonobvious In View of Lee, Pullen, Oikawa, Wu and Boice

The Examiner erroneously rejected claims 34-46 of the application.

All of the rejections are fundamentally flawed at least because of the Examiner's primary reliance on Lee. Lee does not teach or suggest particular elements of each claim, and the other cited references relied on in the Office Action (Pullen, Oikawa, Wu and Boice) fail to cure these deficiencies of Lee. As discussed in more detail below, the rejected claims are generally related to determining a relationship between first metric values and respective quantities of encoded video data based on a reference video including a plurality of macroblocks. After this relationship is determined based on the reference video the method receives an input video that includes a plurality of macroblocks distinct from the plurality of macroblocks of the reference video. Conversely, Lee describes a bit rate control algorithm that determines quantization parameters for a current macroblock based on a previous macroblock of the same video (i.e., of the same plurality of macroblocks) that is being encoded.

Independent method claim 34 recites, in part (emphasis added):

determining a relationship between first metric values and respective quantities of encoded video data, the first metric values generated by encoding reference video data from a reference video, the reference video including a plurality of macroblocks, using a metric function and respective first encoding parameters;

after determining the relationship, . . .

receiving an input video, the input video including a plurality of macroblocks distinct from the plurality of macroblocks of the reference video;

generating second metric values from input video data of the input video using respective second encoding parameters;

selecting at least one of the second encoding parameters based on a desired quantity of encoded video data and the relationship between the first metric values and the respective quantities of encoded video data; and

encoding the input video data using the selected at least one encoding parameter.

Lee, Pullen, Oikawa, Wu and Boice do not teach or suggest receiving an input video after determining a relationship between respective quantities of encoded video data and first metric values that are generated by encoding reference video data from a reference video. Instead, Lee uses previously encoded macroblocks of the same video as part of its encoding algorithm, and does not teach or suggest using any other video apart from the video that is being encoded.¹ Thus, Lee never suggests receiving an input video of macroblocks after determining such a relationship using a reference video of macroblocks.

Applicants respectfully submit that the Examiner is mistakenly confusing the “reference macroblock” of Lee with the “reference video” of claim 34, which includes a plurality of macroblocks. The Examiner explains in detail how Lee is deemed to use information (such as a scaling factor) regarding a previous macroblock to encode a current macroblock. However, such information is irrelevant to the claimed invention because a reference macroblock cannot include a plurality of macroblocks, and thus, cannot be the reference video recited in claim 34. Moreover, nothing in Lee suggest receiving the current macroblock or any other macroblocks after determining a relationship between metric values generated by encoding reference video data from a reference video of plural macroblocks.

Furthermore, Lee describes generating the reference encoding parameter for each macroblock using the metric value of that macroblock (while not distinguishing between any

¹ The remainder of the remarks largely addresses Lee because the Examiner relies on Pullen solely as showing a generic video encoder, which is immaterial to the claim features being addressed and the other references do not teach or suggest the features of the claims discussed herein that Lee lacks, and the Examiner does not allege the other references teach or suggest these features discussed herein that Lee lacks. However, it should be understood that any combination of Lee, Pullen, Oikawa, Wu and Boice does not suggest those features.

first and second encoding parameters), as opposed to “generating second metric values from...using respective second encoding parameters,” as recited in claim 34. Accordingly, for at least these reasons, Lee does not teach or suggest “generating second metric values from input video data of the input video using respective second encoding parameters”

In particular, the Examiner alleges that this element is disclosed by Lee because, as the Examiner states in the Response to Arguments Section on page 2 of the final Office Action, “Lee discloses to select the reference macroblock that has the closest scaling factor, where the scaling factor is the normalized activity, and then adjust the initial quantization parameter.” This process of Lee is described in detail below, which demonstrates that Lee describes generating the reference encoding parameter *for each macroblock* using the metric value *of that macroblock* as opposed to “generating second metric values from...using respective second encoding parameters.”

The value of the particular reference quantization parameter for a macroblock of Lee is determined based on the bit rate control parameter and on the metric value of the current block. In particular, the spatial activity metric value (N_{actj}) of Lee for a macroblock of a particular video stream is used as the scaling factor γ_i in determining the reference quantization factor q_i (i.e., encoding parameter) *for that macroblock*. See the excerpt below from page 67, Section 3.2, of Lee:

For estimating the reference quantization parameter for each macroblock, we define the following equation based on rate distortion theory [2]:

$$q_i = 2^C \times \gamma_i$$

where C is a parameter that controls bit rate, and γ_i is a scaling factor which characterizes the properties of the current macroblock....We may use N_{actj} as the scaling factor γ_i for macroblock i .

Next, the Examiner alleges that Lee discloses “selecting at least one of the second encoding parameters...” This is incorrect. Lee describes generating a quantization parameter Q_i for a current macroblock using the reference quantization parameter Q_{ref} for the current macroblock and a difference (Δ) between the actual number of coding bits (BIT_{actual}) and the number of estimated coding bits ($BIT_{estimated}$) of the current macroblock. Such values are used to determine the single quantization parameter Q_i for the macroblock without using any “selecting”

step to select from among plural generated encoding parameters after they are generated. See Figure 1 of Lee on page 68.

In addition, claim 34 states, “first metric values,” are “generated by encoding reference video data from a reference video,” and the “second metric values” are generated “from input video data of the input video” (emphasis added). As shown above, Lee does not describe an “input video including a plurality of macroblocks distinct from the plurality of macroblocks of the reference video.” (emphasis added). Thus, Lee cannot describe “first metric values” and “second metric values” generated as recited in claim 34. For at least these reasons, Lee does not teach or suggest “selecting at least one of the second encoding parameters based on a desired quantity of encoded video data and the relationship between the first metric values and the respective quantities of encoded video data.”

Thus, for at least these reasons, Applicants respectfully submit that independent claim 34 is allowable over the relied-upon references.

Claims 35-41 depend on claim 34 and thus are also nonobvious in view of the cited references for at least the same reasons presented in the above discussion.

Claim 42 is directed to a video decoding module and recites language that is similar, although not identical, to the language of claim 34. For example, claim 42 recites “a memory configured to store a predetermined relationship between first metric values and respective quantities of encoded video data, the predetermined relationship being determined during a calibration process and based at least in part on generating the first metric values from reference video data of a reference video ... including a plurality of macroblocks...” and “a predictor module configured to receive input video data from an input video ... including a plurality of macroblocks distinct from the plurality of macroblocks of the reference video.” As discussed above, Lee does not teach or suggest receiving an input video that is distinct from a reference video. Oikawa does not supply the missing teaching, and instead is being cited simply for teaching the use of a memory (page 4, lines 12-13 of OA).

Similar to the selecting step of claim 34, claim 42 recites “a selector module configured to select at least one of the second encoding parameters based on a desired quantity of encoded video data and the stored predetermined relationship.” As discussed above, Lee and Pullen do not describe any selection from among plural second encoding parameters, and

Oikawa does not supply the missing teaching. Even if the prior art had suggested some selection between parameters rather than the determination of a single parameter from an equation as in Lee, the prior art still would not suggest making a selection based on a stored predetermined relationship that was determined based on reference video data of a reference video, because none of the references suggests any reference video distinct from the input video.

Claims 42-46 depend on claim 41 and thus are also nonobvious in view of the cited references for at least the same reasons presented in the above discussion.

C. Claim 36 is Nonobvious In View of Lee, Pullen, Oikawa, Wu and Boice for Additional Reasons

Claim 36 depends directly from claim 34, and thus, claim 36 is nonobvious for the reasons expressed above with respect to independent claim 34. In addition, the cited prior art does not teach or suggest the additional features of claim 36. For example, claim 36 states (emphasis added):

36. The method of claim 34 wherein the determining the relationship between first metric values and respective quantities of encoded video data is performed as part of a calibration process, and wherein the receiving the input video occurs after the calibration process is performed.

The Examiner cites section 3.2 “Proposed Alogorithm” of Lee as disclosing the additional elements of claim 36. Section 3.2 of Lee discusses estimating the reference quantization factor for each macroblock of the video currently being encoded. As discussed above, to do this, Lee uses previously encoded macroblocks of the same video being encoded as part of its encoding algorithm, and does not teach or suggest using any other video apart from the video that is being encoded. Thus, assuming the Examiner is interpreting the estimating the reference quantization factor for each macroblock of the same video currently being encoded as a “calibration process,” it follows Lee does not disclose receiving any distinct input video after the calibration process.

For at least the foregoing additional reasons, claim 36 is nonobvious in view of the cited references.

Respectfully submitted,

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VIII. CLAIMS APPENDIX

1-4. (Canceled)

5. (Previously Presented) A method for use in encoding input video data, comprising:

determining a relationship between metric values generated from reference video data using a metric function and respective first encoding parameters, and quantities of encoded video data generated by encoding said reference video data using said respective first encoding parameters;

using said metric function to generate metric values from said input video data and respective second encoding parameters;

selecting at least one of said second encoding parameters on the basis of a desired quantity of encoded video data and said relationship; and

under control of at least one of a configured hardware circuit and a configured computer, encoding said input video data using the selected at least one encoding parameter,

wherein said metric function is a spatial activity metric function based on a sum of weighted AC discrete cosine transformation coefficients and is of the form,

$\sum_{u,v} \frac{|f(u,v)|}{w(u,v)q(u,v)}$, where $f(u,v)$ is a discrete cosine transformation coefficient of a block

element with coordinates (u, v) , $w(u,v)$ is a weight for said coefficient, and $q(u,v)$ is a quantization parameter for said coefficient.

6. (Previously Presented) A method as claimed in claim 5, wherein said relationship is a power law relationship.

7. (Previously Presented) A method as claimed in claim 5, wherein said metric function is based on AC coefficients of discrete cosine transformation data generated from said video data.

8-9. (Canceled)

10. (Previously Presented) A method for use in encoding input video data, comprising:

determining a relationship between metric values generated from reference video data using a metric function and respective first encoding parameters, and quantities of encoded video data generated by encoding said reference video data using said respective first encoding parameters;

using said metric function to generate metric values from said input video data and respective second encoding parameters;

selecting at least one of said second encoding parameters on the basis of a desired quantity of encoded video data and said relationship; and

under control of at least one of a configured hardware circuit and a configured computer, encoding said input video data using the selected at least one encoding parameter,

wherein said metric function is a spatial activity metric function based on a sum of weighted AC discrete cosine transformation coefficients and is of the form,

$$\sum_{u,v} \frac{|f(u,v) * h(u,v)|}{w(u,v)q(u,v)} =$$
, where $f(u,v)$ is a discrete cosine transformation coefficient of a block element with coordinates (u, v) , $w(u,v)$ is a weight for said coefficient, $q(u,v)$ is a quantization parameter for said coefficient, and $h(u,v)$ is a spatial weighting factor for said coefficient.

11. (Previously Presented) A method as claimed in claim 5, wherein metric values are determined for each 8x8 pixel block of said video data using said metric function.

12. (Original) A method as claimed in claim 11, including determining a metric value for a macroblock by summing metric values for the constituent 8x8 pixel blocks.

13. (Previously Presented) A method as claimed in claim 5, including determining basic metric values from said metric function and basic encoding parameters, and deriving metric values from said basic metric values.

14. (Original) A method as claimed in claim 13, including deriving said metric values from said basic metric values using shift and add operations.

15. (Previously Presented) A method as claimed in claim 5, wherein said metric function is based on the number of non-zero AC discrete cosine transformation coefficients after quantization.

16. (Original) A method as claimed in claim 15, wherein said metric function is used to determine metric values for a macroblock of six 8x8 pixel blocks.

17-24. (Canceled)

25. (Previously Presented) A video encoding module for use in encoding input video data, comprising:

means for determining a relationship between metric values generated from reference video data using a metric function and respective first encoding parameters, and quantities of encoded video data generated by encoding said reference video data using said respective first encoding parameters, during a calibration process;

means for storing said relationship;

means for using said metric function to generate metric values from said input video data and respective second encoding parameters; and

means for selecting at least one of said second encoding parameters on the basis of a desired quantity of encoded video data and said relationship,

wherein said metric function is a spatial activity metric function based on a sum of weighted AC discrete cosine transformation coefficients and is of the form,

$$\sum_{u,v} \frac{|f(u,v)|}{w(u,v)q(u,v)},$$
 where $f(u,v)$ is a discrete cosine transformation coefficient of a block

element with coordinates (u, v) , $w(u,v)$ is a weight for said coefficient, and $q(u,v)$ is a quantization parameter for said coefficient.

26. (Previously Presented) A video encoding module for use in encoding input video data, comprising:

means for determining a relationship between metric values generated from reference video data using a metric function and respective first encoding parameters, and quantities of encoded video data generated by encoding said reference video data using said respective first encoding parameters, during a calibration process;

means for storing said relationship;

means for using said metric function to generate metric values from said input video data and respective second encoding parameters; and

means for selecting at least one of said second encoding parameters on the basis of a desired quantity of encoded video data and said relationship,

wherein said metric function is a spatial activity metric function based on a sum of weighted AC discrete cosine transformation coefficients and is of the form,

$$\sum_{u,v} \frac{|f(u,v) * h(u,v)|}{w(u,v)q(u,v)},$$
 where $f(u,v)$ is a discrete cosine transformation coefficient of a block element with coordinates (u, v) , $w(u,v)$ is a weight for said coefficient, $q(u,v)$ is a quantization parameter for said coefficient, and $h(u,v)$ is a spatial weighting factor for said coefficient.

27-29. (Canceled)

30. (Previously Presented) A video encoding module, comprising:

a memory configured to store a relationship between metric values generated from reference video data using a metric function and respective first encoding parameters, and quantities of encoded video data generated by encoding the reference video data using the respective first encoding parameters, the relationship determined during a calibration process;

a predictor module configured to use the metric function to generate metric values from input video data and respective second encoding parameters; and

a selector module configured to select at least one of the second encoding parameters on the basis of a desired quantity of encoded video data and the relationship,

wherein the metric function is a spatial activity metric function based on a sum of weighted AC discrete cosine transformation coefficients and is of the form, $\sum_{u,v} \frac{|f(u,v)|}{w(u,v)q(u,v)}$,

where $f(u,v)$ is a discrete cosine transformation coefficient of a block element with coordinates (u, v) , $w(u,v)$ is a weight for the coefficient, and $q(u,v)$ is a quantization parameter for the coefficient, and

wherein the video encoding module further includes at least one of a dedicated hardware circuit configured to implement the predictor module, and a processor configured to execute the predictor module.

31. (Previously Presented) The video encoding module of claim 30, wherein said relationship is a power law relationship.

32. (Previously Presented) A video encoding module, comprising:

a memory configured to store a relationship between metric values generated from reference video data using a metric function and respective first encoding parameters, and quantities of encoded video data generated by encoding the reference video data using the respective first encoding parameters, the relationship determined during a calibration process;

a predictor module configured to use the metric function to generate metric values from input video data and respective second encoding parameters; and

a selector module configured to select at least one of the second encoding parameters on the basis of a desired quantity of encoded video data and the relationship,

wherein the metric function is a spatial activity metric function based on a sum of weighted AC discrete cosine transformation coefficients and is of the form,

$\sum_{u,v} \frac{|f(u,v)*h(u,v)|}{w(u,v)q(u,v)}$, where $f(u,v)$ is a discrete cosine transformation coefficient of a block

element with coordinates (u, v) , $w(u,v)$ is a weight for the coefficient, $q(u,v)$ is a quantization parameter for the coefficient, and $h(u,v)$ is a spatial weighting factor for the coefficient, and

wherein the video encoding module further includes at least one of a dedicated hardware circuit configured to implement the predictor module, and a processor configured to execute the predictor module.

33. (Previously Presented) The video encoding module of claim 32, wherein metric values are determined for each 8x8 pixel block of said video data using said metric function.

34. (Previously Presented) A method, comprising:

- determining a relationship between first metric values and respective quantities of encoded video data, the first metric values generated by encoding reference video data from a reference video, the reference video including a plurality of macroblocks, using a metric function and respective first encoding parameters;
- after determining the relationship, under control of a video encoder that is at least one of a configured hardware circuit and a programmed computer:
 - receiving an input video, the input video including a plurality of macroblocks distinct from the plurality of macroblocks of the reference video;
 - generating second metric values from input video data of the input video using respective second encoding parameters;
 - selecting at least one of the second encoding parameters based on a desired quantity of encoded video data and the relationship between the first metric values and the respective quantities of encoded video data; and
 - encoding the input video data using the selected at least one encoding parameter.

35. (Previously Presented) The method of claim 34 further including, after the determining the relationship between first metric values and respective quantities of encoded video data and before receiving the input video, storing the relationship for use in the selecting at least one of the second encoding parameters based on the desired quantity of encoded video data and the relationship.

36. (Previously Presented) The method of claim 34 wherein the determining the relationship between first metric values and respective quantities of encoded video data is performed as part of a calibration process, and wherein the receiving the input video occurs after the calibration process is performed.

37. (Previously Presented) The method of claim 34, wherein the relationship is a power law relationship.

38. (Previously Presented) The method of claim 34, wherein the metric function is one of at least:

based on AC coefficients of discrete cosine transformation data generated from video data, and

a spatial activity metric function based on a sum of weighted AC discrete cosine transformation coefficients.

39. (Previously Presented) The method of claim 34, further comprising:
determining basic metric values from the metric function and basic encoding parameters; and

deriving metric values from the basic metric values.

40. (Previously Presented) The method of claim 39, wherein the deriving metric values includes deriving the metric values from the basic metric values using shift and add operations.

41. (Previously Presented) The method of claim 34, wherein the selecting the at least one of the second encoding parameters based on a desired quantity of encoded video data and the relationship between the first metric values and the respective quantities of encoded video data is performed using the second metric values.

42. (Previously Presented) A video encoding module, comprising:

a memory configured to store a predetermined relationship between first metric values and respective quantities of encoded video data, the predetermined relationship being determined during a calibration process and based at least in part on generating the first metric values from reference video data of a reference video, the reference video including a plurality of macroblocks, using a metric function and respective first encoding parameters, and generating the respective quantities by encoding the reference video data using the respective first encoding parameters;

a predictor module configured to receive input video data from an input video, the input video including a plurality of macroblocks distinct from the plurality of macroblocks of the reference video, and to generate second metric values from the input video data using the metric function and respective second encoding parameters; and

a selector module configured to select at least one of the second encoding parameters based on a desired quantity of encoded video data and the stored predetermined relationship,

wherein the video encoding module further includes at least one of a dedicated hardware circuit configured to implement the predictor module, and a processor configured to execute the predictor module.

43. (Previously Presented) The video encoding module of claim 42, wherein the predetermined relationship is a power law relationship.

44. (Previously Presented) The video encoding module of claim 42, wherein the metric function is one of at least:

based on AC coefficients of discrete cosine transformation data generated from video data, and

a spatial activity metric function based on a sum of weighted AC discrete cosine transformation coefficients.

45. (Previously Presented) The method of claim 34 wherein the first and second encoding parameters are quantization vectors.

46. (Previously Presented) The video encoding module of claim 42 wherein the first and second encoding parameters are quantization vectors.